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(54) Title: SETTING-UP SYSTEM FOR REMOTELY CONTROLLED CAMERAS
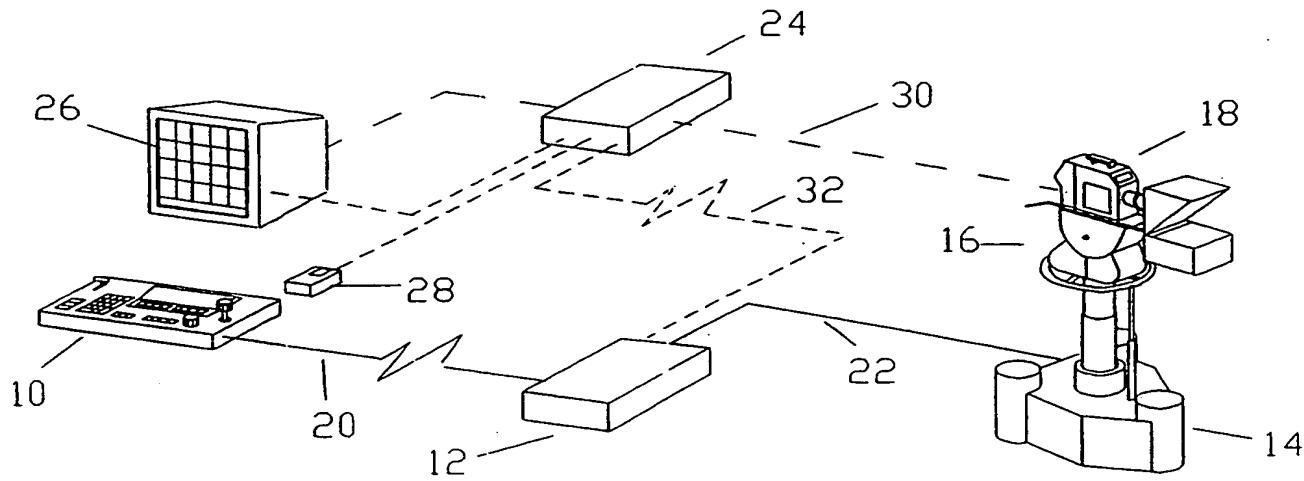
(57) Abstract

In a remote control system for one or more robotic cameras (18), in which a camera can be moved between stored positions, a frame of video is grabbed and stored for each stored camera position, and the stored pictures are displayed on a monitor (26). Selection of a desired camera position is then made by selecting the appropriate displayed picture, for example using a mouse (28), light pen or touch screen.

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SETTING-UP SYSTEM FOR REMOTELY CONTROLLED CAMERAS

The present invention relates to a remote control system for one or more robotic video cameras.

Robotic camera systems are known in which the camera position (e.g. X position, Y position, height, pan angle, tilt angle, zoom setting, focus setting or any combination of these) can be remotely controlled, for example using a controller having a manually operable joystick. A known system available from Radamec EPO Limited, of Chertsey, Surrey, United Kingdom also permits camera positions to be stored with an associated shot number or code. Then, when one of the shot codes is selected, the camera is moved automatically to the respective stored position. Such a system may be utilised in broadcast studios, for parliamentary television and in closed circuit television systems.

Difficulties can arise in operating this known system, especially when a large number of camera positions are stored because the operator needs to be able to associate the camera position he requires with its respective shot code or number. Occasionally mistakes are made, resulting in unintended pictures being transmitted.

In accordance with the present invention, for each stored camera position a respective picture associated with that camera position is stored; the stored pictures are displayed; and a required camera position is selected by selecting the respective displayed picture. Accordingly, there is no need for the operator to remember shot codes or numbers, but merely to select a picture which represents the required output.

Preferably, the system is operable to determine when the camera, or the selected one of the cameras, has adopted its selected position, and then to replace the respective stored picture with the picture currently provided by that camera. Thus, if the system is used, for example, in a news broadcast studio, and if one of the stored positions has an associated picture showing the head and shoulders of a first newscaster, then if a second newscaster presents the next news bulletin, once that picture is selected and the camera has adopted the associated position, the stored picture of the head and shoulders of the first newscaster is replaced by a picture of the head and shoulders

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of the second newscaster.

Preferably, a plurality of the stored pictures are displayed simultaneously, for example in a four-by-four array. In this case, picture selection can for example, be by means of a mouse or the like

5 or by using a touch-screen for the display. Additionally, or alternatively, the stored pictures can be paged on the display.

The system of the present invention may be used with a plurality of robotic cameras, and in this case in addition to storing each camera position, the identity of the camera which is selectably to adopt that

10 position is also stored. In the case where a plurality of the stored pictures are displayed simultaneously, the system may have a first mode (which can be called "camera mode") in which all of the simultaneously displayed pictures relate to one camera. Additionally or alternatively, the system may have a second mode (which can be called

15 "story board mode") in which the simultaneously displayed pictures may relate to more than one of the cameras and in which selection of one of the pictures also serves to select the respective camera and the respective position.

Specific embodiments of the present invention will now be

20 described, by way of example, with reference to the accompanying drawings, in which:

Figure 1 is a schematic perspective view of a single camera system according to the invention;

Figure 2 is an example camera mode display screen:

25 Figure 3 is an example story board mode display screen: and

Figure 4 is a schematic perspective view of a multiple camera, dual control system according to the invention.

Referring to Figure 1, the system shown includes a control panel 10, an electronics unit 12, a robotic pedestal 14, a motorised pan and

30 tilt head 16 and a video camera 18. The control panel 10 and electronics unit 12 may be provided by an "advanced robotic control (ARC)" available from Radamec EPO. The pedestal 14 may be a "robotic pedestal (RP2)" available from Radamec EPO. The pan and tilt head 16 may be a "425 Pan & Tilt Head" as available from Radamec EPO. The

35 control panel 10 has various keys, knobs and joysticks and supplies signals _via_ line 20 to the electronics unit 12, which in turn supplies signals _via_ line 22 to cause the robotic pedestal to move as desired in

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X and Y directions and to adjust the height of the camera, and also to
cause the pan and tilt head 16 to adjust the pan and tilt of the
camera, and optionally also the zoom and focus settings. The control
panel 10 and electronics unit 12 can also store various position
settings, and when a stored position is recalled, the camera 18 is
moved to the stored position.

The system of Figure 1 also includes a personal computer 24 with
an associated monitor 26 and mouse or other pointer device 28. The
computer 24 may be a standard PC, but is fitted with one or more frame
grabber cards, which are connected by line 30 to the video output of
the camera 18. The computer 24 is also linked, for example via a
serial I/O port and line 32, to the electronics unit 12.

The computer 24 is programmed so that the system operates as
follows.

DISPLAY

The computer 24 causes the monitor 26 to display a screen 34 such
as is shown in Figure 2. The screen contains, for example, a 4 x 4
array of sixteen shot areas, Shot A to Shot P, and also contains a menu
bar 36 with such items as "store", "recall", "sequence" and "stop".
Some of the shot areas may be blank, and when the system is first used
all of the shot areas on the monitor will be blank.

POSITIONING

The camera 18 can be positioned, as in the conventional system,
by manually operating the controls of the control panel 10, to adjust
the X and Y positions and height of the camera, and also the pan and
tilt, and focus and zoom settings.

STORE

Once a desired position of the camera has been adopted, that
position can be stored. This is done by clicking the mouse on the
"store" area of the menu bar 36 and then clicking the mouse on the
desired shot area of the display. When this is done, firstly the
current position of the camera is stored by the electronics unit 12
together with a shot code. Secondly, a frame of the video signal
provided by the camera 18 is frame grabbed by the computer 24 and

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stored in the computer memory along with the shot code. Thirdly, that frame of video is displayed in reduced size at the appropriate shot area on the monitor 26. In the case where the mouse is clicked on a blank shot area, the new position data and the new frame of video data are added to the memories in the electronics unit 12 and the computer 24. On the other hand, in the case where the mouse is clicked on a previously occupied shot area, the previously stored position data and frame of video data is overwritten with the new position data and frame of video data.

RECALL

In order to cause the camera 18 to adopt a previously stored position, firstly the mouse is clicked on "recall" on the display menu bar 36, and then is clicked on the shot area of the display of the desired camera position. The computer 24 determines the respective shot code and commands the electronics unit 12 to move the camera to the position stored by the electronics unit 12 for that shot code. Accordingly, the electronics unit 12 drives the robotic pedestal 14 and the motorised pan and tilt head 16 to cause the camera 18 to adopt the selected position.

PAGING

As described above, in this specific embodiment, the monitor 26 can display up to 16 pictures simultaneously. The system may be arranged to store more than 16 positions, and in this case, the shot pictures are displayed on the monitor 26 in pages of 16 shot pictures, and the operator can page the display by clicking the mouse on "sequence" on the display menu bar 30, causing the pages of shot pictures to cycle. Alternatively, the monitor 26 may display a single shot picture, with the paging facility being used to cycle through the stored shot pictures.

AUTOMATIC UPDATE

In a development of the system described above, the stored shot pictures may be updated each time a position is recalled. Thus, following on from the recall operation described above, when the camera 18 has adopted the selected position, a further frame of the video

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signal is grabbed by the computer 24 and used to overwrite the
previously stored video frame, but without changing the stored position
data or the shot code. The freshly grabbed frame of video is then
displayed in reduced size at the appropriate shot area on the monitor
5   26.

MULTIPLE CAMERAS

         The arrangement shown in Figure 1 may be modified to include more
than one camera 18, each with an associated robotic pedestal 14, pan
10   and tilt head 16 and electronics unit 12. In this case, the
electronics units 12 may be connected to a single control panel 10 and
also to a single computer 24, and the video cameras 18 may be connected
to respective frame grabber inputs of the computer 24. In this case,
one of the cameras 18 can be selected, in conventional manner, from the
15   control panel 10, but additionally or alternatively, the menu bar 30 of
the display 28 may include areas, such as "cam 1", "cam 2", "cam 3",
"cam 4" on which the mouse can be clicked to select the appropriate
camera. When one of the cameras is selected, the screen 34 displays
the stored shot pictures for the selected camera. When a position is
20   to be stored, the mouse is clicked on "store" on the menu bar 36 and
then on the desired shot area, and then not only is the position data
stored by the respective electronics unit 12, but the computer 24 grabs
a frame of video from the respective camera 18 and stores it, along
with not only the shot code, but also the identity of the camera for
25   that shot. When a shot is recalled, the computer 24 commands the
appropriate electronics unit 12 to position its camera 18, and
optionally when the camera is on position a fresh frame of video is
grabbed from that camera and used to update the respective shot area.

30   ALTERNATIVE DISPLAY

         Figure 3 shows an alternative screen 34 which may be displayed by
the monitor 26. Like the screen of Figure 2, the Figure 3 screen has
a 4 x 4 array of sixteen shot areas, but also has two menu bars 36a,
36b. The menu bar 36a has such items as "cut", "stop", "fade",
35   "store", "clear" and "recall", and the menu bar 36b has such items as
"page up", "page down", "story board" and "clear all". Each shot area
has an "on shot" indicator provided by a rectangle, for example, near

the top-left corner of the shot area, which may be illuminated to
indicate that the respective camera is positioned for that shot. Also,
the number (1-4) of the camera for each shot picture is displayed near
the top-left corner of the shot area. The system can operate in a
"camera mode" and in a "story board mode". In order to select the
story board mode, the mouse is clicked on "story board" on the menu bar
36b, and "story board" is then displayed in reverse video. In order to
return to camera mode, the mouse is again clicked on "story board" and
"story board" then reverts to normal video.

CAMERA MODE

In camera mode the displayed shot pictures all relate to the same
camera. The required camera can be selected using the control panel
10.

CAMERA MODE - STORE

In order to store a new position, the selected camera is firstly
moved to the desired position using the controls on the control panel
10. Once the desired position has been adopted, the mouse is clicked
on "store" on the menu bar 36a, which then turns to inverse video, and
is then clicked on the desired shot area. The position and a shot code
are then stored by the respective electronics unit 12. Also, a frame
of video from the respective camera 18 is grabbed and stored by the
computer 24, together with the shot code and the camera number, and a
reduced size form of the grabbed frame is displayed at the selected
shot area and the associated on shot indicator is illuminated.

CAMERA MODE - RECALL

In order to recall a stored camera position when in camera mode,
firstly the required camera is selected, if necessary, using the
control panel 10, and the screen 34 displays a first page of stored
shot pictures for that camera. If more than sixteen shots have been
stored, the operator can page through the stored shots by clicking the
mouse on "page up" or "page down" on the menu bar 36b. Once the
desired shot picture is displayed, the mouse is then clicked on
"recall" on the menu bar 36a, which then turns to inverse video. The
mouse is then clicked on the desired shot area. The computer 24

commands the electronics unit 12 of the selected camera to move to the required position. Once the camera has adopted the required position, the respective on shot indicator is illuminated in the selected shot area and the video output is switched to the selected camera. This switching may be effected as a "cut" or a "fade" depending upon which of "cut" and "fade" has been previously mouse-selected on the menu bar 36a, the selected item being displayed in inverse video. As with the previously described system, once the camera has adopted the required position, a fresh frame may be grabbed and used to update the stored picture for that shot.

Also, once the selected camera has adopted its required position, "recall" on the menu bar 36a reverts to normal video.

STORY BOARD MODE

In story board mode, the screen 34 can display shot pictures for different cameras, and Figure 3 actually schematically represents a story board mode screen. In a four camera system it is therefore possible that up to four of the shot pictures can have their on shot indicators illuminated.

STORY BOARD MODE - STORE

The store operation in story board mode is similar to that in camera mode. That is to say, the desired camera is selected and positioned using the control panel 10 and then the mouse is clicked on "store" and on the required shot position on the screen 34.

STORY BOARD MODE - RECALL

Recall in story board mode is also similar to that in camera mode, except that the required camera is not separately selected. Instead, the selection of the camera takes place by way of the selection of the shot picture.

OTHER FACILITIES

Other facilities may be provided in the system. For example, in order to clear one of the shot pictures and the associated stored data, the mouse is clicked on "clear" on the menu bar 36a and is then clicked on the shot area to be cleared. If all of the shots are to be cleared,

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then the mouse is clicked on "clear" on the menu bar 36a and is then clicked on "clear all" on the menu bar 36b.

SYSTEM EXPANSION

5   The systems described above can be expanded to include a plurality of controls for one or more cameras. For example, Figure 4 shows a system having three cameras 18 each with its associated robotic pedestal 14, pan and tilt head 16 and electronics unit 12. Furthermore, two control panels 10 are provided, and two computers 24

10   are provided each with its associated monitor 26 and mouse 28.

OTHER MODIFICATIONS AND DEVELOPMENTS

       It will be appreciated that many other modifications and developments may be made to the systems described above. For example,

15   it is possible to copy a shot picture from a camera mode page to a story board mode page. Also, rather than using a mouse 28 as the pointing device, it is possible to use a light pen or a touch screen monitor. Furthermore, it is possible to transfer the shot pictures and other data to other devices and use another such device to select a

20   camera position. For example, the computer 28 may be networked with one or more other computers. Also, a printer may be provided enabling the screens of shot pictures and other data to be printed out. Additionally, a further mode of operation may be provided in which each row of shot pictures on the screen relates to a respective camera, and

25   in which the shot pictures in a column can be selected simultaneously, causing up to, for example, four cameras to move to the associated positions simultaneously.

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CLAIMS

1.   A remote control system for one or more robotic cameras, comprising:

    means to store a plurality of camera positions;

    means to select one of the stored camera positions; and

    means to cause the camera or at least one selected one of the cameras to adopt the selected position;

    characterised by:

    means to store for each stored camera position a respective picture associated with that camera position; and

    means to display the stored pictures;

    the position selecting means being operated by selecting the displayed picture for the position to be selected.

2.   A system as claimed in claim 1, further comprising means to determine when the camera, or the selected one of the cameras, has adopted the selected position, and means to replace the respective stored picture with the picture currently provided by that camera.

3.   A system as claimed in claim 1 or 2, wherein the display means is operable to display a plurality of the stored pictures simultaneously.

4.   A system as claimed in any preceding claim, wherein the display means can be paged between at least one stored picture and at least one other stored picture.

5.   A system as claimed in any preceding claim for use with a plurality of robotic video cameras, and further comprising means to store a camera identity for each stored camera position.

6.   A system as claimed in claim 5 when dependent directly or indirectly on claim 3, further comprising means to select one of the cameras, and wherein the system is operable in a mode in which all of the simultaneously displayed pictures relate to the selected camera.

7.   A system as claimed in claim 5 or 6 when dependent directly or

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indirectly on claim 3, wherein the system is operable in a mode in
which the simultaneously displayed pictures may relate to more than one
of the cameras, and wherein selection of one of the pictures serves to
select the respective camera and the respective position.

5

FIG 1

Shot A	Shot B	Shot C	Shot D
Shot E	Shot F	Shot G	Shot H
Shot I	Shot J	Shot K	Shot L
Shot M	Shot N	Shot O	Shot P
CAM 1 CAM 2 CAM 3 CAM 4	STORE RECALL SEQUENCE STOP		

34

36
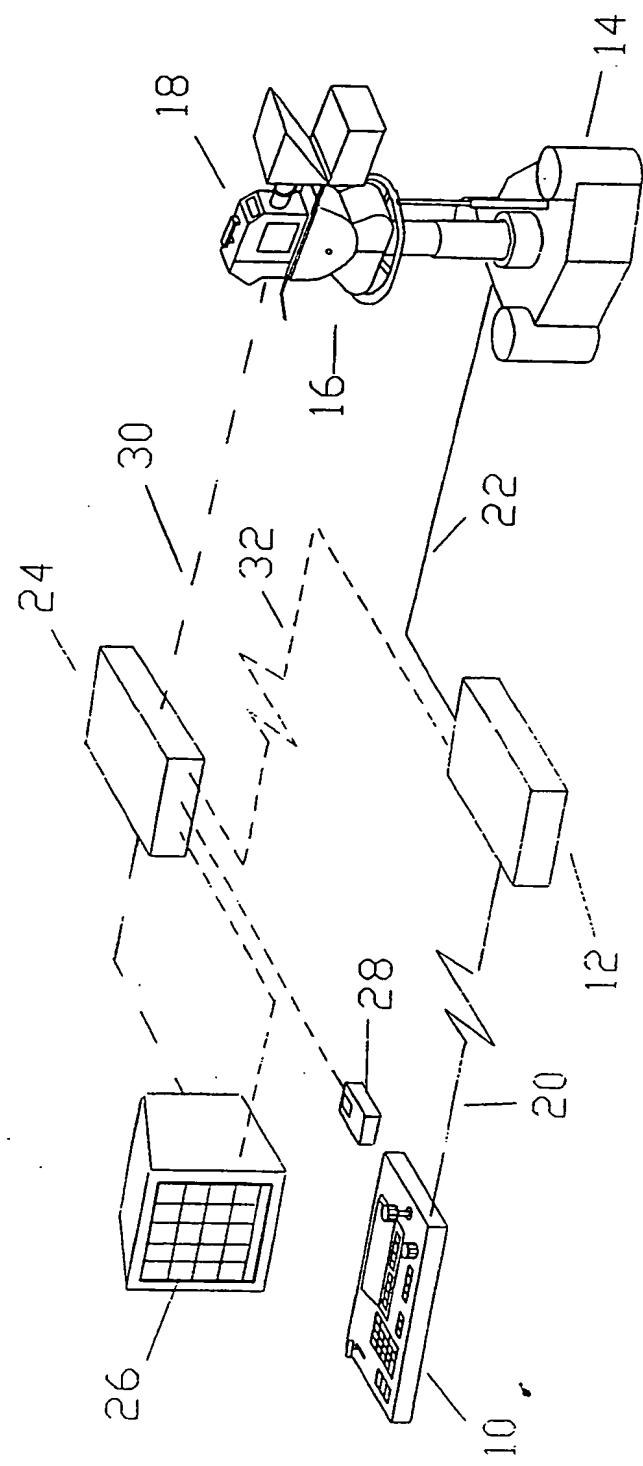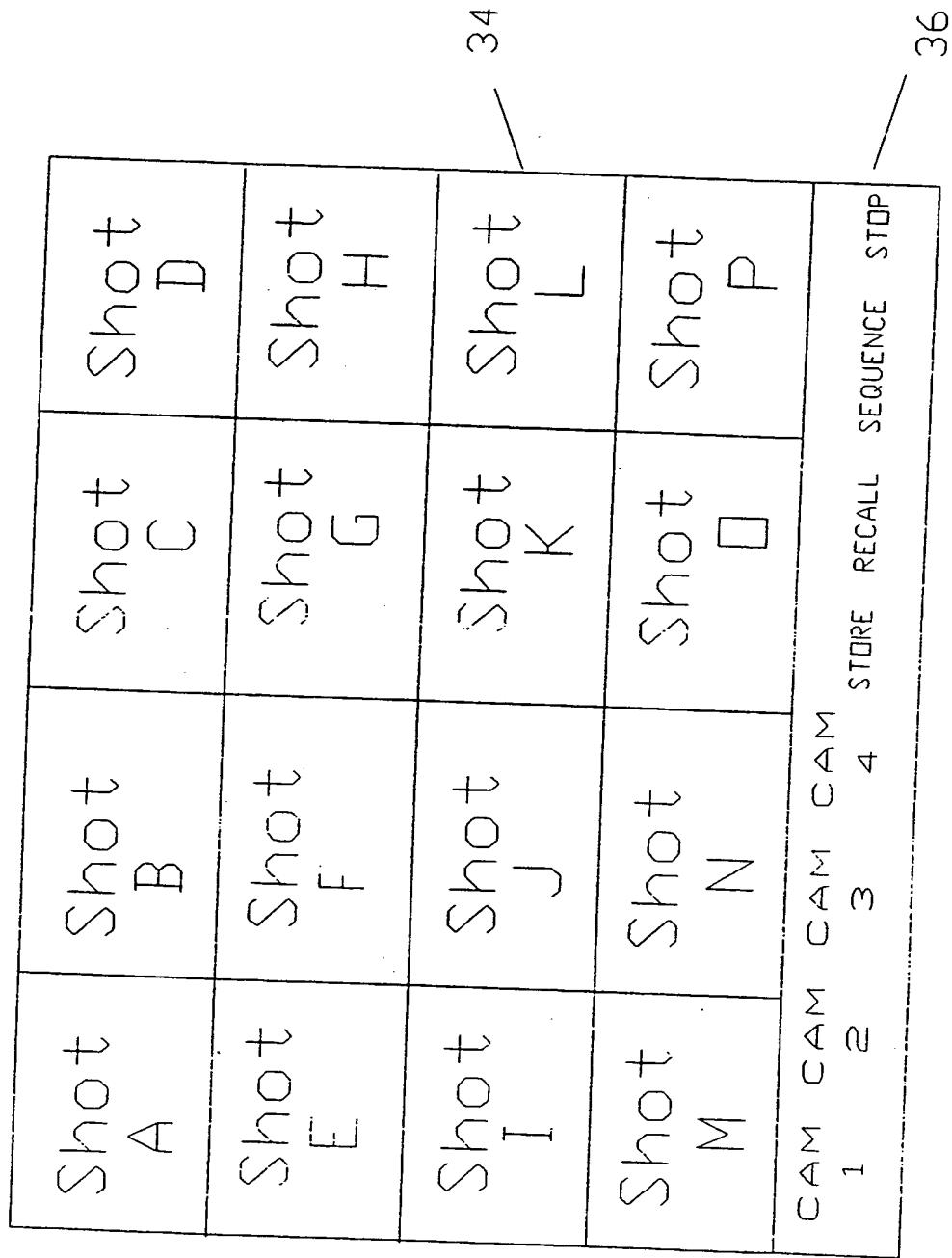
FIG 2
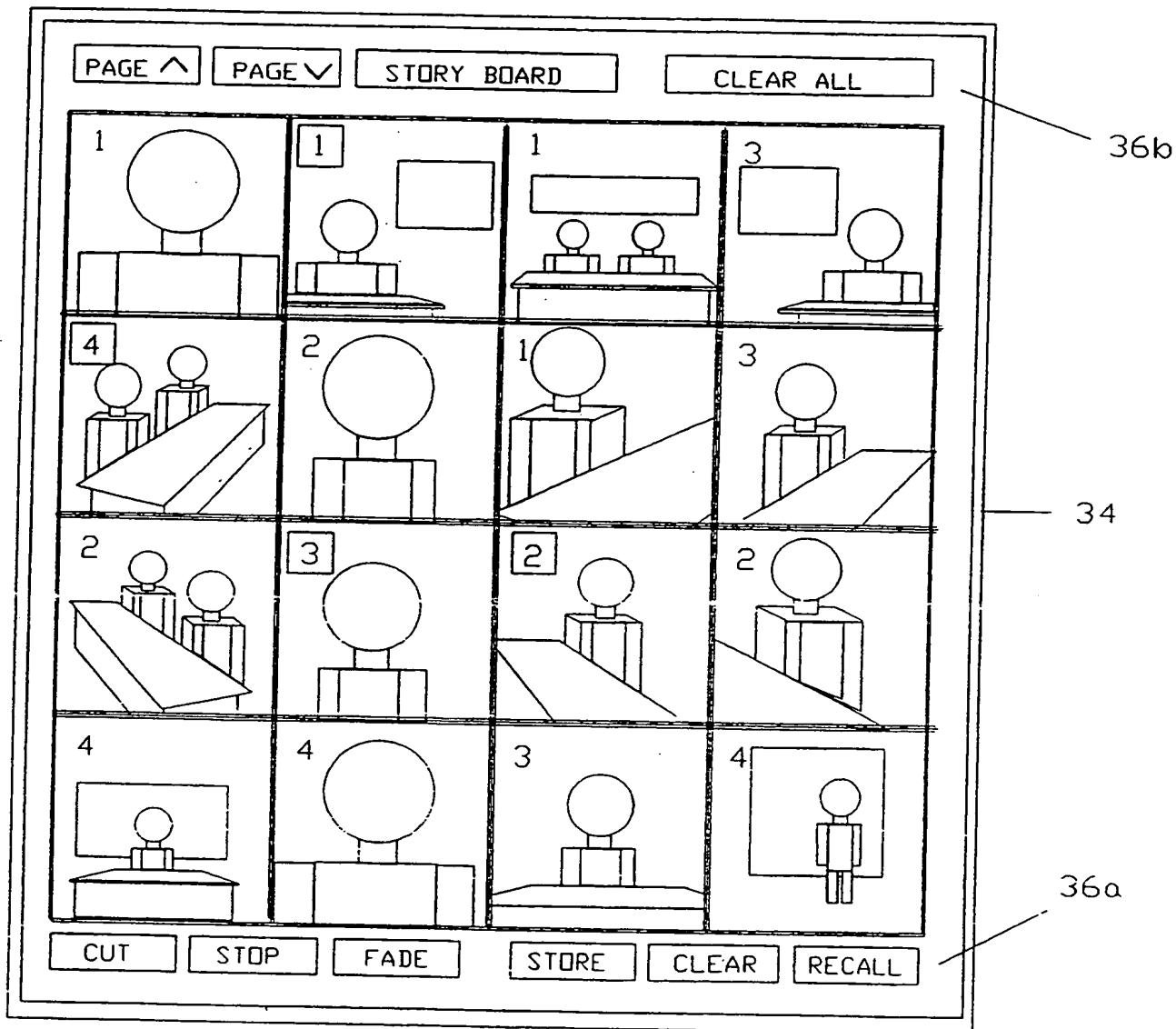
FIG 3

4 / 4
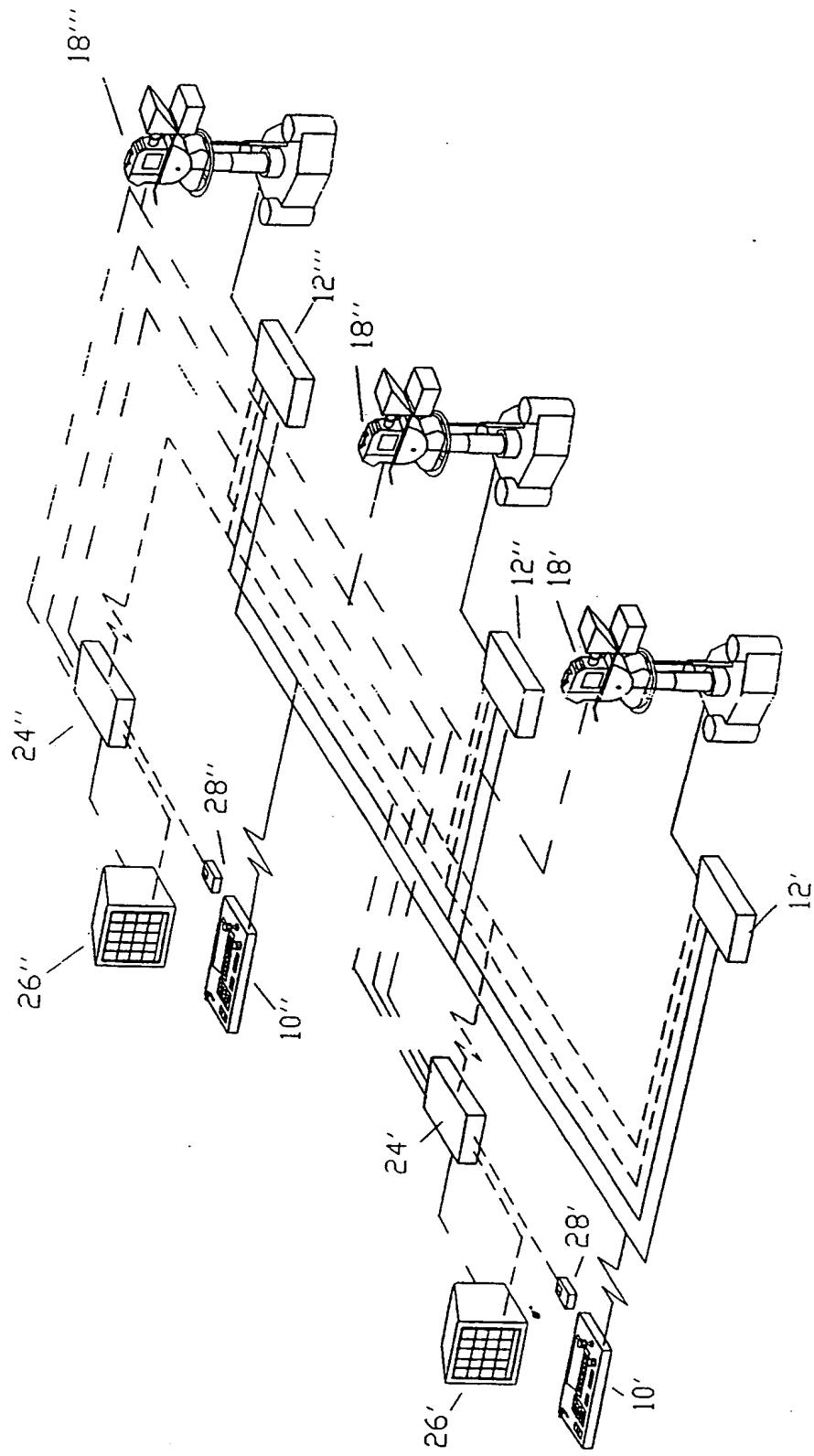
FIG 4

INTERNATIONAL SEARCH REPORT

International Application No | PCT/GB 92/01694

I. CLASSIFICATION CF SUBJECT MATTER   (if several classification symbols apply, indicate all)⁶

According to International Patent Classification (IPC) or to both National Classification and IPC

Int.Cl. 5 H04N5/232;   H04N5/222

II. FIELDS SEARCHED

Minimum Documentation Searched⁷

Classification System	Classification Symbols
Int.Cl. 5	H04N ; G08B

Documentation Searched other than Minimum Documentation
to the Extent that such Documents are Included in the Fields Searched⁸

III. DOCUMENTS CONSIDERED TO BE RELEVANT⁹

Category °	Citation of Document, ¹¹ with indication, where appropriate, of the relevant passages ¹²	Relevant to Claim No.¹³
A	SMPTE JOURNAL vol. 95, no. 7, July 1986, SCARSDALE, NY US pages 736 - 740 P. SCHMALE 'Coach: a tool for centralized maintenance' see page 736, line 1 - page 737, right column, line 45 ---	1
A	US,A,4 992 866 (MORGAN) 12 February 1991 see column 2, line 6 - line 37 see column 2, line 63 - column 3, line 68 see column 4, line 46 - column 5, line 48 see figure 3 --- -/--	1

IV. CERTIFICATION

Date of the Actual Completion of the International Search	Date of Mailing of this International Search Report
22 DECEMBER 1992	15. 01. 93

International Searching Authority	Signature of Authorized Officer
EUROPEAN PATENT OFFICE	DUHR R.H.J.E.

Category °	Citation of Document, with indication, where appropriate, of the relevant passages	Relevant to Claim No.
A	PATENT ABSTRACTS OF JAPAN vol. 15, no. 114 (E-1047)19 March 1991 & JP,A,03 006 178 (CANON INC.) 11 January 1991 see abstract ---	1
A	US,A,4 931 872 (STODDARD ET AL.) 5 June 1990 see column 2, line 18 - line 28 see column 4, line 48 - column 5, line 17 see column 8, line 9 - line 47 see column 10, line 6 - line 27 ---	1
A	US,A,4 170 024 (DISCHERT) 2 October 1979 see abstract -----	1

III. DOCUMENTS CONSIDERED TO BE RELEVANT   (CONTINUED FROM THE SECOND SHEET)

This annex lists the patent family members relating to the patent documents cited in the above-mentioned international search report.
The members are as contained in the European Patent Office EDP file on
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Patent document cited in search report	Publication date	Patent family member(s)		Publication date
US-A-4992866	12-02-91	CA-A-	2020033	30-12-90
		GB-A-	2235848	13-03-91
US-A-4931872	05-06-90	None		
US-A-4170024	02-10-79	GB-A-	1602615	11-11-81
		AU-A-	3640178	29-11-79
		DE-A,C	2823634	07-12-78
		FR-A,B	2393490	29-12-78
		JP-C-	1458893	28-09-88
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		JP-B-	60013595	08-04-85
		NL-A-	7805826	04-12-78

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